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Meeting of the Group of Experts on
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28 October to 1 November 1985, Addis Ababa, Ethiopia

LE/NAIROBI.

STANDARDIZATION
OF
TECHNICAL SPECIFICATIONS
OF
BASIC MAPS IN AFRICA

S U M M A R Y

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The present document has been prepared by the African Association of Cartography "AAC" for use as a working document for the expert group meeting on the standardization of specifications for basic topographical maps in Africa convened by the United Nations Economic Commission for Africa "ECA".

The second part of this work has been achieved with the close collaboration of:

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The AAC thanks the "ECA and "INC" of Algeria for their active support for the achievement of this preliminary survey on a question of general interest.

The Secretary General
African Association of
Cartography
"Consultant"

Dr. Ing. FEZZANI Chedly
11 December, 1984

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STANDARDIZATION OF TECHNICAL SPECIFICATIONS OF BASIC MAPS IN AFRICA

INTRODUCTION

As far back as 1949, the African scientific conference of Johanesburg was anxious to study the possibility of harmonizing and standardizing some cartographic data such as Ellipsoid, projection system, sheetlines, division, scales, conventional signs and toponymy transcription. The Johanesburg conference was followed by a meeting of specialists in surveying, and mapping held at Bukavi (Zaire) in September 1953. The recommendations made at these meetings have narrowed down some of the differences but have not completely achieved all the objectives.

Although the question of standardization of map specification has been raised at every United Nations Regional Cartographic Conference for Africa, it has never been possible to deal with the subject fully; hence, a big handicap in the development of an African geoscientific cartography essential for the implementation of the Lagos Plan of Action.

In that respect, the Fifth United Nations Regional Cartographic Conference for Africa (Cairo, February - March, 1983) and the Fourth Session of the Council of the African Association of Cartography (AAC) at Dakar in December, 1983, mandated the ECA and the AAC to study the matter and take appropriate action. In persuance of the relevant resolutions adopted by the ECA Conference of Ministers AAC sent questionnaires to all African countries which some made it possible to obtain elements which, in combination with those at the ECA, enabled the writing of this preliminary study which will serve as a working document for the expert group meeting.

The first part of the document is taken from an AAC study and it summarizes basic mathematical concepts of African Cartography. The second part is a comparative study of conventional signs used for maps at the scales of 1:50 000 and 1:200 000 or 1:250 000 it takes into account conventional signs used by countries which provided information on the questionnaire or from selected maps among those held at the headquarters of the ECA and the AAC.

The toponymy and standardizations of geographical names cannot be dealt with now at continental level, but within the framework of African linguistic divisions as established by the United Nations.

As regards the 1:50 000 scale, it is suggested also to study conventional signs recommended at the Second United Nations Regional Cartographic Conference for Asia and Far-East (Tokyo October - November, 1958). As for the 1:1 000 000 scale, it is further urged to adopt conventionnal signs already established for the International Map of the World (I.M.W.). The ECA and the AAC are doing their best to obtain copies of I.M.W. specifications published by the United Nations under sales number 63.1.20 E/Conf.40/9 for those cartographic institutions in Africa which may need them.

PART ONE

I. WHY THE STANDARDIZATION OF MAP SPECIFICATIONS IN AFRICA

If cartographic mapping remains for a long time without being matched to economic expansion, it will take another decade to produce a map of new significance in the light of growing needs for new types of maps to match essential needs in technical, industrial and scientific developments as well as social and economic evolution. Although, we must admit that it is important that maps must answer national requirements, we must not also neglect the need for cartographic standardization in order to:

- facilitate international and regional co-operation among nations aiming at the production of topographic maps of common interest and encouraging the development of African geoscientific cartography.

- allow African maps to extend continously beyond international borders in order to facilitate regional planning operations.

It is not always possible to adopt truly standardized norms for the entire African continent, but at least they should be regarded as a kind of an ideal to achieve. The main objective is not to reduce particularism between different African cartographic programmes, but to bring closer specialised institutions through defining specifications which they adopt themselves for their needs at national, sub-regional and continental levels: such an action, the first during post-independence period, will certainly expand usage of basic maps and contribute to the strengthening of co-operation and economic development.

As soon as this stage responsible for cartography is achieved, it will then require national institutions in Africa to make an attempt at standardizing in the production of new series of national maps.

II. FUNDAMENTALS OF MATHEMATICAL SYSTEMS FOR AN AFRICAN CARTOGRAPHY

African geodetic systems are contained in a separate study.

It will be recalled that Africa is about to have a unified continental geodetic network through the Near Doppler Survey Project (ADOS). This objective remained only an idea since it was first discussed 20 years ago at the First United Nations Regional Cartographic Conference for Africa at Nairobi, in 1963 until recently.

This African continental network will:

- remedy the absence of basic control networks over a great part of Africa;

- be used as support for the development of national networks essential for fruitful and harmonious growth of cartography at national as well as at regional level;

- ensure connection of different national networks and set a stage for worthwhile technical and scientific co-operation among different countries; and

- provide a better definition of a reference spheroid and a uniform datum for Africa.

This continental network will consist of an average of 350 zero-order points over Africa with a minimum of two to three points per country.

Two African computing centers: the Centre at Nairobi and the African Consortium of Data Processing "ACDP" at Algiers (created under the aegis of the AAC) deal with the transfer of technology for the benefit of Africa. The ADOS network and the major continental chains will constitute structural attachment for national networks, the correction of which will do away with mathematical distortions introduced in the past to external limits as a result of the accumulation of errors from within.

The AAC has started to examine the post-ADOS phase on the basis of recommendations in resolution No. four of the Fourth Session of the Council of the AAC at Dakar (December 1983). This post-ADOS phase will consist of actions at two levels:

- the first should be undertaken at national level by an appropriate official institution, which will control not only the evaluation of achievements in the field of geodesy, in precise levelling and gravimetry by a critical analysis of the existing situation, but also establish a work plan for the densification and adjustment of national primary networks to that of ADOS.

- the other should be conducted at sub-regional and continental levels for the definition and achieving connections between national networks.

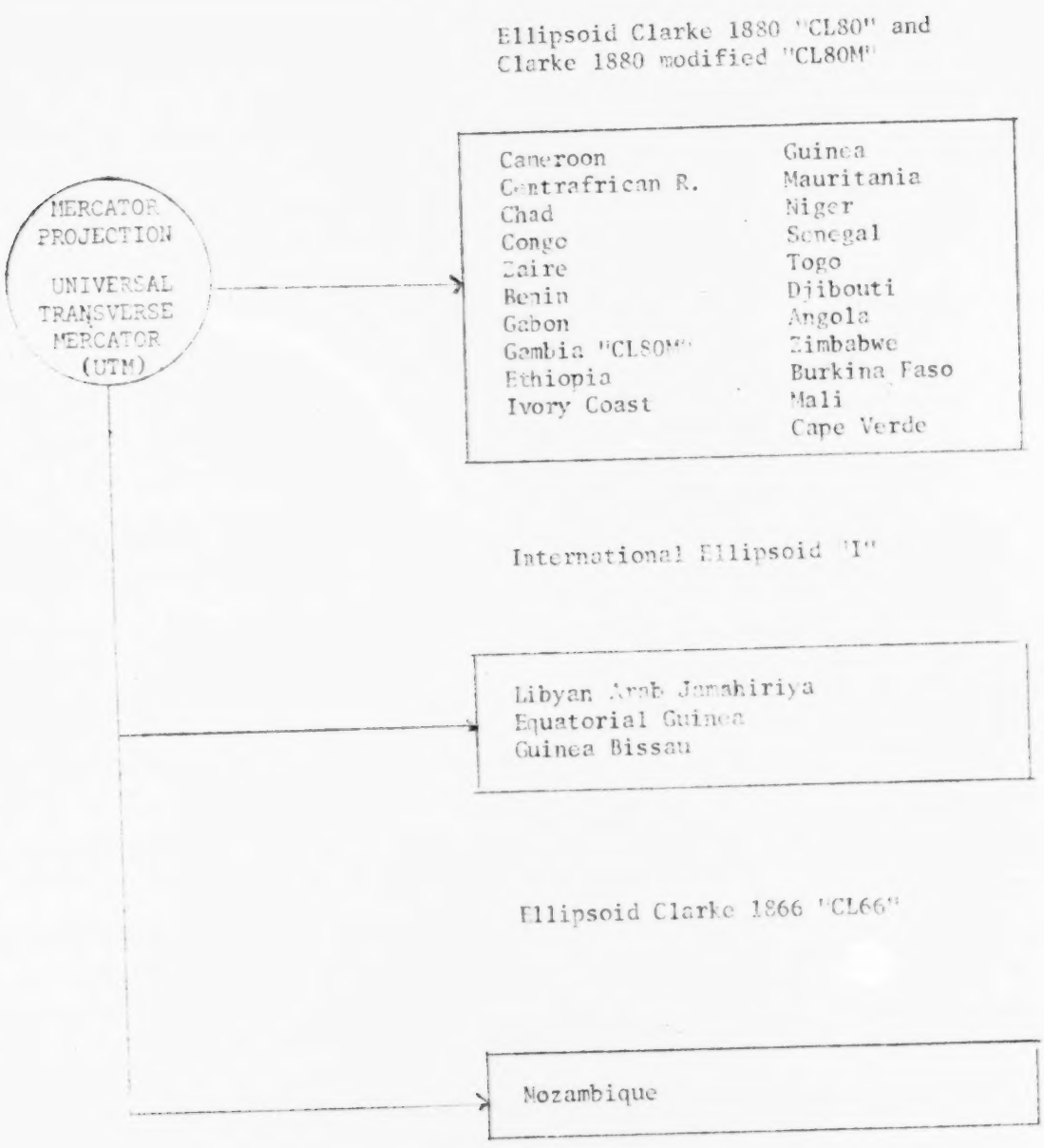
At the present stage, it is recommended to all African countries to:

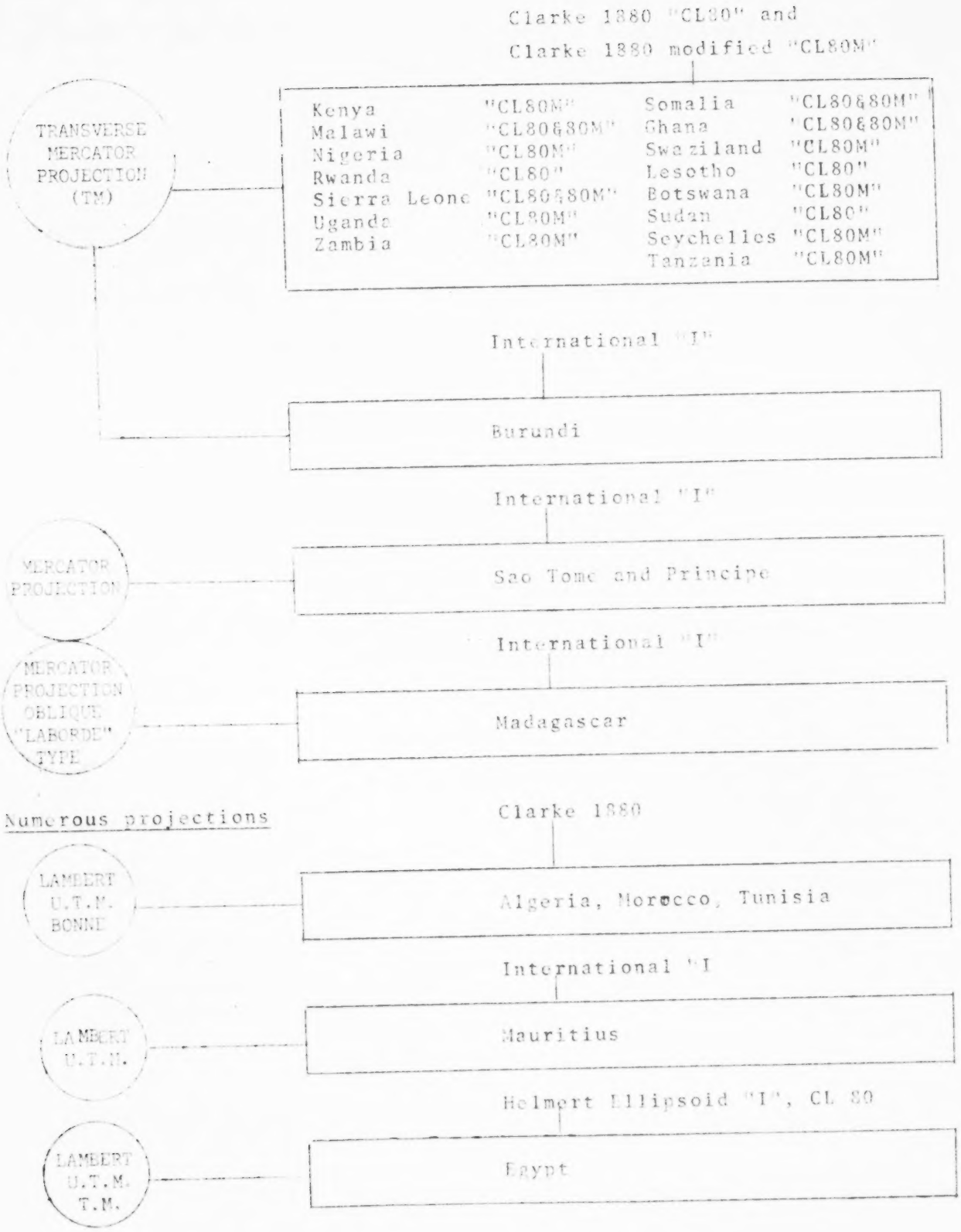
- adhere, without reservations, to the completion of the observations of the ADOS network;

- undertake appropriate examination as regards the strength of their network; and

- support the ECA and AAC in their endeavours to achieve these goals.

A. PLANE AND ELLIPSOIDAL REPRESENTATION SYSTEMS IN USE IN AFRICA




Clarke 1880 "CL80" and
Clarke 1880 modified "CL80M"
TRANSVERSE MERCATOR PROJECTION (TM)
Kenya "CL80M"
Malawi "CL80&80M"
Nigeria "CL80M"
Rwanda "CL80"
Sierra Leone "CL80&80M"
Uganda "CL80M"
Zambia "CL80M"
Somalia "CL80&80M"
Ghana "CL80&80M"
Swaziland "CL80M"
Lesotho "CL80"
Botswana "CL80M"
Sudan "CL80"
Seychelles "CL80M"
Tanzania "CL80M"
International "I"
Burundi
International "I"
MERCATOR PROJECTION
Sao Tome and Principe
International "I"
MERCATOR PROJECTION OBLIQUE "LABORDE" TYPE
Madagascar
Numerous projections
Clarke 1880
LAMBERT U.T.M. BONNE
Algeria, Morocco, Tunisia
International "I
LAMBERT U.T.M.
Mauritius
Helmert Ellipsoid "I", CL 80
LAMBERT U.T.M. T.M.
Egypt

The total area in Km^2 and the percentage covered by different projection systems and the ellipsoids used are given below:

- main projections

U.T.M.	15 555 km^2	51.6% of the continent
TM (including South Africa and Namibia)	9 720 km^2	32.2% of the continent
Lambert UTM	4 280 km^2	14.2% of the continent
Mercator and oblique mercator	590 km^2	2.0% of the continent
	30 145 km^2	100 %

- ellipsoids

Clarke 1880 and 1880 modified (including South Africa and Namibia	25 900 km^2	85.9% of the continent
Clarke 1866	800 km^2	2.7% of the continent
International	2 420 km^2	8.0% of the continent
More than a single ellipsoid	1 025 km^2	3.4% of the continent
	30 145 km^2	100%

Clarke 1880 ellipsoid covers a most 86% of the surface of the continent. At the present time, it fits best to the geoid and differences between two belts are minimised than the case with other ellipsoids, and particularly the International ellipsoid.

The UTM projection as a main projection with nearly a coverage of 52% of the continent is used by at least 24 countries. It covers a belt of 6^o in longitude.

The TM projection covers a little over 32% of the continent and in the majority of cases some countries use this projection on UTM grid. Fifteen countries in Africa, South Africa and Namibia inclusive, have preference for this grid system. This projection distinguishes itself from the UTM on account of the variable width of the zones used ($\neq 6^o$).

= /

Lambert projection together with the TM Projection accounts for 14% representation of the continent.

Note should be taken that the North African countries namely, Algeria, Morocco, Tunisia, have a legacy for certain projections. The progressive generalisation of the UTM projection, in a way, will remain for these countries as it descends from old mapping traditions.

The old cartography is revived. Taking into account this fact and the possibility of countries easily converting to TM projection, there is every possibility that the UTM projection covering over 98% of the continent will be employed for mapping. It will be recalled that the UTM projection system was adopted as reference plane coordinates system at world level.

A.1: FUNDAMENTAL OBSERVATIONS

It is completely out of the question to add anything whatsoever to the theory of cartographic projection. Each system has definite advantages. We consider that there is a real need for plane coordinates but the whole problem is about the determination of the kind of projection system to adopt and of the parameters of the reference system.

Essentially, it is after the Second World War that the need for a unified reference system in plane coordinates at global level, became necessary, and new criteria were formulated to respond to growing demand for artillery as much as for range and precision. Moreover, it is time for change of projections, although having no effect on defined geographic coordinates in a given geodetic system (a difficult operation) must be fully justified. It is the obvious deficiency of the system or systems in use that justifies eventually the change over of reference system of rectangular coordinates.

This situation is exactly what is prevailing in almost all African countries because rarely do they possess an evaluated geodetic system and a universally accepted criterion. On the other hand, by examining the state of African cartography, it is observed that at the end of 1980 approximately:

24% of the continent was covered at the scale of 1:50 000 and
79% was covered at 1:200 000 and 1:250 000 scales.

But this coverage is not only out of time with present needs, but basically remains on work foundations. It therefore needs a complete overhaul.

All these remarks should find place which must be taken in a good report if we sincerely desire to lay foundations on which to build a future geoscientific cartography as divergencies between different criteria for systems employed are a great handicap for the future.

A.2: RECOMMENDATIONS

Having regard to all facts mentioned above, it is strongly recommended:

- to use Clarke 1880 ellipsoid for new maps and for all geodetic computations;

- to adopt the UTM projection (Universal Transverse Mercator) in zones of 6^{o} for basic maps of the earth and to ensure its systematic use at least for derived and thematic maps.

If these recommendations are adopted, a complementary study will be undertaken which will deal with all the aspects, parameters and the reference ellipsoid of Clarke 1880 and the UTM projection.

B. DIVISIONS

With the choice of the projection and ellipsoid though delicate it is desirable to add the sheetline systems to adopt for basic maps and derived maps because the problem of joining sheets is a very complex operation whose attainment is never perfect.

Each kind of sheetline division has its advantages and disadvantages.

The geographic sheetlines have the advantage of a single system for the whole cartographic work, but presents difficulties of variation of size and assemblage when there are more than four to five sheets. On the other hand, rectangular sheetlines allow:

- the assembly for an unlimited number of sheets;
- building a uniform map file for ease of storage; presentation and dispatching; and
- standardized material and reconciliation of the different sheetlines.

This breakdown which is more economical (fewer sheets of films and paper and time saving in preparation) gives the possibility of having a single system of information reference and can be adopted no matter the kind of projection. Its major disadvantage is its disorientation in relation to the geographic network as soon as one moves farther away from the cenral meridian.

It is observed here, that the International Map of the World (IMW) at 1:1 000 000 uses the geographic sheetlines, each sheet having dimensions of 4^{o} in latitude and 6^{o} in longitude, The sub-multiples of this breakdown are as follows:

maps at 1:500 000	:	$2^{o} \times 3^{o}$
maps at 1:250 000	:	$1^{o} \times 1^{o}30'$
maps at 1:200 000	:	$1^{o} \times 1^{o}$
maps at 1:100 000	:	$30' \times 30'$
maps at 1: 50 000	:	$15' \times 15'$
maps at 1: 25 000	:	$7'30'' \times 7'30''$

p. 1- Nature and size of sheetlines used by African countries

Abbreviation

Geographic division: G
Rectangular division: P

COUNTRIES	Size used for maps at scales							
	1/ 25000	1/ 50 000	1/ 100 000	1/ 200 000	1/ 250 000	1/ 500 000	1/ 1000000	Observ
South Africa		G: 15'x15'			G:1°x2°			
Algeria	R: 40x64cm	R: 40x64cm	R: 40x64cm	R: 40x64cm C:1°x1°				
Angola			G: 30'x30' variable		Ci°x1°			
Benin		C: 15'x15'		G:1°x1°				
Botswana		G: 15'x15'			C: 1°30"x1°			
Burkina Faso				C:1°x1°				
Burundi		C: 15'x15'	G: 30'x30'					
Cameroon		C: 15'x15'		G.1°x1°				
Cape Verde		G:3'50' x9'50"	G: variable					
Central Afr.		C: 15'x15'		C:1°x1°				
Congo		C: 15'x15'		G:1°x1°				
Ivory Coast		C: 15'x15'		C:1°x1°				
Djibouti			C: 30'x30'					
Egypt	G:7'30 x 7'30"	G: 15x15'	G: 30'x30'	G:1°x1°		G: 30°x2°	G:6°x4°	
Ethiopia		C: 15'x15'			C: 1°x1°30'		C:4°x6°	
Gabon		C: 15'x15' (58x58cm)		C:1°x1°		G: 75x75cm		
Gambia	C: variable	C: 15'x15'	G: (*) variable					och: 1/125000
Chana	R:48x 48cm	C: 15'x15'	G: 30'x30'	C: 1°x1°	C: 1°x1°	C: 6°x4°		

Sources: AAC study + United Nations World Cartography Vols X and XIV.

COUNTRIES	Size used for map at scales							
	1/ 25000	1/ 50 000	1/ 100 000	1/ 200 000	1/ 250 000	1/ 500 000	1/ 1000000	Observ.
Equatorial Guinea		G: 17'x10'	G: 30'x30'	G: 50'x1°10'				
Kenya		G:15'x15' 55,5 x 55,2cm	G:30'x30' (55,5x 55,2cm)		G:1°x1°30 30'(64,5 x44,1cm)		G: 86x101cm	
Lesotho		G: 15' x15'			G: 1°15'x10			
Libya		G: 15'x15'			G: 1°x1°30'			
Madagascar	G:4'48' x7'12" 45x64cm	G:12'x18' (45x64cm	G:24'x18' 45x32 cm)			R: 56x91cm	G:4°x8°	
Malawi		G: 15'x15'			G: 1°x1°30'			
Mali		G: 15'x15'		G:1°x1°				
Morocco		G: 15'x15'	G: 30'x30'		G: 1°x1°30'			
Mauritius	G:8'x8' G:10'x 10'		G: 35'x33'					
Mauritania		G 15'x15'		G: 1°x1°				
Mozambique		G: 15'x15'						
Niger		G: 15'x15'		G:1°x1°				
Nigeria		G 15'x15'	G: 30'x30'		G:1°x1°			
Uganda		G: 15'x15'			G: 1°x1°30'			
Rwanda	R: 55x66cm	G:15'x 15'(55x 66cm)	G.30'x 30'(55x 66cm)	G:1°x1°				
Sao Tome & Princip	G: 9'x10' 7'x10'	G: 15'x15'			G:1°x1°; 1°x1°30			
Senegal		G: 15'x15'		G:1°x1°				
Seychelles		G: 12'x17'						

COUNTRIES	Files used for map at scales							
	1/ 25000	1/ 50 000	1/ 100 000	1/ 200 000	1/ 250 000	1/ 500 000	1/ 1000000	Observ.
Sierra Leone		G: 15'x15'			G: 1°x1°30'			
Somalia	G: 30' x 30'		(*) G: 30'x30'					(*) ech 1/250000
Sudan	P: 2'x32p		P: 2'x32p		P: 4px32p			P:pouch
Swaziland		G: 15'x15'						
Tanzania		G: 15'x15'			G: 1°x1°30'			
Tchad		G: 15'x15'		G:1°x1°				
Togo		G: 15'x15'		G:1°x1°		G:6'x2°		
Tunisia	R: 40x64cm	R: 40x64cm	R: 30x48cm	G:1°x1°		G 94x63cm 94x46cm	G: 87x45cm	
Zaire	G: 7'30"x7'30"	G: 15'x15'	G 30'x30'	G 1°x1°				
Zambia		G: 15'x15'			G: 1°x1°30'			
Zimbabwe		G: 15'x15'			G: 1°x1°30'			

Concerning the 46 countries listed above (except for South Africa), we can take into account the following aspects:

1. All those countries use geographic sheetlines for their basic mapping with the exception of Algeria and Tunisia.

2. The geographic breakdown used is derived from sheetlines of the International Map of the World "IMW". Some countries are obliged to adopt different sheet sizes in order to accommodate shape of the country concerned.

Thus a de facto standardization is accepted for Africa as far as breakdown and sheetlines are concerned.

B.2: RECOMMENDATIONS

It is recommended except for specific difficulties to adopt the geographic breakdown discending from the "IMW" for all thematic, consequential, and basic topographical maps, according to the following dimensions:

15' x 15'	for maps at 1:50 000
1^{o} x 1^{o}	for maps at 1:200 000
1^{o} x $1^{o}30'$	for maps at 1:250 000

Sheet edges should be designed by longitudes and latitudes to whole degrees or fraction of degree(s) specified above.

C. STANDARD UNITS OF MEASUREMENT

The adoption of the metre as a standard unit of measurement for vertical and horizontal distances, needs not be disputed. Therefore, the adoption of the metric unit for the countries which still use the imperial unit when revising existing editions or publish new ones is strongly recommended.

D. MAP SCALE

The choice of a logical range of scales in a limited number is capable of correctly covering the totality of needs; also it constitutes one of the first concerns when determining a cartographic system.

The range of scales indicated hereunder, in accordance with the metric system, serves as a basis for the selection of scales to adopt:

1:500

1:1 000

1:2 000

1:5 000 1:10 000 1:20 000

1:25 000

1:50 000 1:100 000 1:200 000

1:250 000

1:500 000 1:1 000 000

It is not necessary to have a complete range. It can be taken, as a principle, that no standard map scale is recommended for scales larger than 1:20 000 and smaller than 1:1 000 000 because they are used in specific cases and are often governed by other considerations. If there are no compelling consideration for the choice of scale, it is recommended to adopt the following range for national topographical maps.

1:25 000 - 1:100 000

1:50 000 - 1:200 000 or 1:250 000 - 1:500 000 - 1:1 000 000

The 1:200 000 range is widely used as a result of cartographic traditions inherited from France, the same way as 1:250 000 is taken from English traditions.

In that respect, we must recall that the first International Symposium on Recent Crustal Movements in Africa held in Addis Ababa in May 1981, recommended the preparation of topographical maps at 1:250 000 scale. This recommendation was endorsed by resolution 3 (V) of the 5th United Nations Regional Cartographic Conference for Africa (Cairo 1983).

III. STANDARDIZATION OF GEOGRAPHICAL NAMES

Standardization of geographical names on national and even sub-regional level has become more urgent for all countries from the moment when people became aware of the need to standardize place names at international level.

The map maker's role is not without importance. With the help of linguists it is possible to determine correct names and spelling that are commonly in use after field collection and consulting existing records.

In this regard, it is recommended that ECA, hand in hand with the AAC, should implement resolution 12 (V) of the 5th United Nations Regional Cartographic Conference for Africa through the organization of seminars for each division in Africa. These seminars will help member States in setting up national geographical names authorities for the standardization of geographical names.

PART TWO

I. CONVENTIONAL SIGNS

In addition to the mathematical requirements of a cartographic system, it is desirable to formulate rules on methods of representation. Indeed, preparation of each type of map implies the identification of a motivating factor on which depends the features of the map to be drawn and a faithful representation of the facts and elements being depicted on the map.

Crowding of details on a map may sometimes lead to losing essential facts and makes the reading of a map into a laborious deciphering operation.

The studying of signs and symbols imposes two demands namely: subsequent adoption for automation, and secondly rendering them handy for use by various organisations responsible for management and planning.

Each graphic element can vary according to different semiologic factors (form, orientation, dimension, texture, value, colour....) The drawing and representation of each detail is related to the size and scale of the map. Therefore, we must find out the critical relation between the original distribution of the information on the document and the final scale of the representation.

The question of conventional signs is of great importance for the conceptual study of a national mapping programme. Many a time, distinguished specialists in cartographic drawing have pondered over this question. The object, therefore, is to draw from the experience of different African countries and international recommendations in order to build up progressively a legend model adaptable to basic topographic mapping in Africa. Once this legend is adopted, it should not be changed for a long period of time; however, additional signs may be introduced as may be deemed necessary from time to time.

A. BASIC PRINCIPLE

J. Bertin (*) considers that the standardization of conventional signs, is subjective to the following considerations:

"* the fundamental law governing relationships between aspects to represent or retain on the drawing;

* the capacity to memorize is directly proportional to the repetion of visual contact and is inversely proportional to the number of viewings"

The cartographer has two dimensions of the plan to which he must draw concrete or abstract observations through forms which very often are subjective but above all suggestive and evolutive.

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* J. BERTIN: visual perception and cartographic transcription in World Cartography vol XV: United Nations.

In order to overcome this, he uses not only the two dimensions of X and Y, but also visual variables because graphic expression has it language, structures and marks, Visual variables have for the image of rather for the graphic message the same as music note for the phonic translation of a musical composition. These are six: size, value, texture, orientation, shape, colour. Each has its own designated role.

It can be associative (this shape is identical to that), differential (this grain is located before that one and after another one) and quantitative (this point is bigger or smaller than that one. But none of them can bring together more than three characteristics enumerated above; moreover, each one possesses a characteristic more precise than the others.

The size variable is but a variation or the dimension of the sign used. It is the only one which expresses the idea of quantity and, to a lesser degree, it is arranged and varied.

(See Annex I, Fig. 1)

The change of effect is a variation from white to black crossing the range of grey, usually obtained through photographic processes, generaliy obtained through screens. The value is but the translation of the arrangement of order, but it can also be considered as differential.

(See Annex I, Fig. 2)

The grain variable is obtained by enlargement and reducing of a given screen e.g: 50%. It is possible to interprete the differences, but in general is rarely used.

The changeable orientation corresponds to the change in accordance with angle variation of a sign or a line. It is correct as far as positioning is concerned; but often, it is combined with other orientations making it differential.

(See Annex I, Fig. 3)

The variable shape can be taken from the whole existing or imaginary figures. It is essentially associative.

(See Annex I, Fig. 4)

The shade of colour, much varied by map makers, is a matter of big controversy. The rules of application are involved and delicate, because variations of shades are almost endless; colour, above all, is selective.

(See Annex I, Fig. 5)

All these visual variations can be combined; they also can represent positive location and the type of feature depicted either linearly or zonally.

The minimum size of cartographic images, as defined by R. CUENIN (1/) from the point of view of perception are the following:

(i) in theory, one can register in memory one isolated object for all linear objects measuring about 0.1 mm on the map; and with two lines with a space in between for all objects measuring about 0.4 mm on the map (0.1 mm line separated by a space of 0.2 mm).

(ii) details in colours shades can be perceived as soon as they measure more than 0.5 mm on the map; and fortifications can be seen when they are at least 0.3 mm on the map.

These absolute minimas cannot allow differentiation between different kinds of objects, except for those of the same dimension. Therefore, it is necessary to use representative signs for equivalent details or by means of variations of dimension of lines and spaces for ordered details.

This treatment results in a theoretical increase of the dimensions of details.

Topographic maps thus allow a homogenic representation of objects of linear form not differentiated when they have a width larger than to 0.4 mm on the map e.g: a river.

Features in zonal implantation whose edges are between 0.5 mm to 1 mm on the map cannot be identified one from the other by variation of value (hidden or unclear or hollow) or shades of colours, only when the number of types is limited. Beyond 1 mm or better still 2 mm on the map, distinction is easy since an area within a figure is likely to contain visible structures, common place in evocative symbols.

These limits on the map are translated in real dimension as follows:

(1/) R. CUENIN: Topographic Cartography Ed. Eyrolles. Chap.6.2p.183

	0.1 mm	0.2 mm	0.3mm	0.4mm	0.5mm	1mm	2mm
Scale at 1:25 000	2.5 m	5m	7.5m	10m	12m	25m	50m
Scale at 1:50 000	5m	10m	15m	20m	25m	50m	100m
Scale at 1:200 000	20m	40m	60m	80m	100m	200m	400m
Scale at 1:250 000	25m	50m	75	100m	125m	250m	500m

The real dimension of objects, corresponding to the limits indicated above, leads us to conclude that a perfect homogetic representation is possible only at very large scales up to 1:5 000.

Therefore it is imperative, for details in precise positioning, to find out evocative conventional signs of the true shape of detail and focus on its actual position or having a closeness to a point for this position.

As for details concerning linear positioning, the general shape is commanded by sketching and a figuration similar to horizontal arrangement. The rules are expressed by width variations of the sign, by the differences of thickness of lines or by variation of value.

For details in zonal positioning, we cannot really speak of conventional signs since surfaces are limited by shape in horizontal projection but can receive a fill of non-geometric structures or evocative or symbols without positional value (example: for aerodromes, the plane in projection is used).

Finally, it is important to draw attention to the fact that it is practically impossible to keep the same conventional signs for the whole range of scales. When we go down through the range of scales we are led to generalisation by selection, harmonization, schematization as well as putting signs in the same level whereby the apparent importance of details is retained.

Although a complete legend is published with each map, nevertheless, a certain standardization of conventional signs must be looked at so that, exchanges and co-operation between African countries can be intensified and avoid the proliferation of signs for the same detail as the examples presented by R. CUENIN show this:

B. COMPARISON BETWEEN SIGNS USED IN AFRICA

In Africa the present fundamental pre-occupation aims at providing a uniform mapping base at 1:50 000 and 1:200 000 or 1:250 000 in order to respond to requirements for the implementation of the Lagos Plan of Action in the field of resources inventory.

Different legends used in African countries have been compared at scales of 1:50 000 and 1:200 000 or 1:250 000.

The present study has been prepared for use as a working document for a limited group of experts selected for their proven expertise, qualifications and experience in map production. The meeting of this group is expected to facilitate the drawing up of guidelines for a standardization to be adopted and which should take account (as for 1:200 0000scale) of the commendable work presented to the United Nations Second Regional Cartographic Conference for Asia and Far-East (Tokyo 1958).

Appended to this report are the following documents:

Appendix 1 : portions of African maps at 1:50 000

Appendix 1 b : a comparative study of conventional signs used in Africa for 1:50 000 mapping.

Appendix 2 : portions of African maps at 1:200 000 and 1:250 000.

Appendix 2 b : a comparative study of conventional signs used in Africa for mapping at 1:200 000 and 1:250 000.

Conventional signs of Tables in the two appendices are followed by full texts of names used on maps which were used in their compliation.

Legends of thirteen (13) maps at 1:50 000 were compared. They are averagely representative of legends in use in all African sub-regions. This observation is valid for 1:200 000 and 1:250 000 legends. Ten (10) map legends at 1:200 000 and 1:250 000 have been compared.

An important effort on standardization has already been undertaken by the institutions which produced those maps, thus facilitating the work of the expert group.

NB: The horizontal matrices of the text tables of appendices 1 and 2 correspond to the vertical matrices of tables of conventional signs.

Appendix 3: Conventional signs recommended for standardized maps at the scales of 1:100 000 - 1:200 000 - 1:250 000 at the Second United Nations Regional Cartographic Conference for Asia and the Far-East.

Appendix 4: Conventional signs recommended for standardized maps at the scale of 1:500 000 at the Second United Nations Regional Cartographic Conference for Asia and the Far-East.

Appendix 5: Conventional signs adopted for International Maps of the World (IMW) at the scale of 1:1 000 000.

Appendices 3 and 4 may serve as models to conclusions of the work of the expert group. They should be analysed in comparison with appendices 1 and 2.

There is no discussion about appendix 5 except for the addition of supplementary signs, which were the result of many international conferences which are officially adopted world-wide.

II. OTHER ASPECTS OF CARTOGRAPHY TO BE STANDARDIZED

In addition to different aspects of standardization raised in the preceding chapters, description of the grid system used in UTM projection will be completed later as soon as a consensus is reached on its adoption; we must mention other elements to be standardized in the production of topographic maps in and for Africa. Therefore the present preliminary study gives only a brief account of these other aspects. The ECA and the OAU will do their best to present to the meeting of the group of experts more detailed information which can be examined along with other matters. In particular, these are:*

(i) The designation of editions distinguishing editions and/or reprints of the same map. Standardization in this field will undoubtedly remove, thereby easy filing.

(ii) Marginal information

The interest in the standardization of marginal data will not only allow the user to identify any information given in the margin, to select among a variety of information that is more important than the others but also to represent only in relation to the space available.

After many years of experience, cartographic institutions have arrived at the selection of the most important marginal data which are differently combined according to specific problems.

These are:

- Sheet name or title;
- Sheet or reference number;
- Edition;
- Name and number of series;
- Scale statement or [illegible] fraction;
- Scale bar;
- Index to adjoining sheets;
- Reference panel;
- Conversion table;
- Sheet history;
- Meridian convergence and magnetic declination;
- Ellipsoid of reference, geodetic system, projection used and origin;

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* IGN France: Cartographic norms recommended for international use for earth maps. Second United Nations Regional Cartography Conference for Asia and Far-East.

- geographic coordinates of sheet corners;
- method of reproduction;
- indications about survey method of different part of the map;
- compilation notes showing the aerial photographic coverage;
- abbreviation and glossary;
- boundary diagram;
- altitude tints;
- marginal data; and
- list of abbreviations.

These elements are widely or partially represented according to specific traditions on different places in the map.

With regard to the spelling of geographic names and the abbreviation code, these questions are to be examined, as it was mentioned along with linguistic divisions in Africa.

Three other topics namely, recording, specifications concerning vertical aerial photographs used in topographic mapping and the qualitative evaluation of topographic maps should be dealt with, if possible.

CONCLUSIONS

Questions raised in this preliminary study are intended to be used as guides. "It is not the ultimate aim" also,they are not so simple as some may be inclined to believe. Each question requires perfect evaluation of different intervening parameters. Fortunately enough, these are a matter of long experiences within cartographic institutions and many aspects are already standardized.

Africa, with an important scientific legacy on this subject, should contribute to international efforts toward the standardization of basic maps published by different national institutions. It is therefore imperative to go beyond the vision limited to national level and work so that co-operation between nations is possible both at sub-regional or regional level. This is the purpose of producing basic topographic maps according to homogenous geographic whole.

This co-operation is becoming more and more urgent as the need for maps linked to economic development is rising.

The standardization of specifications of basic topographic maps is a valuable step towards the development of cartography in Africa, and also opens the way to a geoscientific cartography necessary for resources inventory in accordance with the Lagos Plan of Action. Its realization in itself represents the actual sharing of responsibilities between different African institutions and is the expression of their willingness to forge ahead intra-African co-operation andlaunch a common front against the scourge of drought and desertification in Africa; through the production of comprehensible maps for any potential users.

Finally it is recommended that maps prepared according to the adopted norms should bear an indication such as: "SSA" Standardized Specifications for Africa" which will give them a new identity from past productions.